REMARKS

Claim Status

Claims 1-34 are pending. Claims 1-34 were rejected.

Drawings

The applicant has designated Figures 1-2 with the Legend --Prior Art--, as illustrated in red ink in the attached drawing page(s).

Specification

Claim Rejections - 35 U.S.C. § 112

The examiner rejected claim 22 as being indefinite for failing to particularly point out and distinctly claim the subject matter that the applicant regards as the invention. More particularly, the examiner points to line 12 and claims that it is not clear which "the light input end" and "the light output end" are referred to (the illumination fiber or the collection fiber). Both fibers have a light input end and a light output end. The examiner is uncertain as to how the light input end can be located adjacently with the light output end.

The applicant has amended claims 22 above to remove the cited uncertainty by replacing the inadvertent reference to "said first fiber section" with -- said illumination fiber section--. Therefore, the applicant respectfully requests that the examiner withdraw the instant rejection.

Claim Rejections - 35 U.S.C. § 102

The examiner rejected claims 1-7, 13-14, 18, 21-22, 24-25, and 30 as being anticipated by Journal of Lightwave Technology (JOLT) in January 1987 or JOLT in August 1987 or Prince (5,133,709) or Kondoh et al. (5,058,978).

The examiner points out that JOLT in January discloses a tapered fiber section (in Figs 1a or 1b) comprising a light input end of a first diameter (Fig 6, taper) and having a light output end of a second diameter greater than said first diameter. The taper section has a generally conical shape.

The examiner points out that Prince discloses a tapered fiber section (in Figure 1) comprising a light input end of a first diameter (in figures 1 and 3) and having a light output end of a second diameter (in figures 1 and 4) greater than said first diameter. The taper section has a generally conical shape.

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The examiner points out that Kondo discloses a tapered fiber section (in Figure 5) comprising a light input end of a first diameter (in figures 5 and 2A) and having a light output end of a second diameter (in figures 5 and 2C) greater than said first diameter. The taper section has a generally conical shape.

The examiner points out that with respect to claim 13, Prince or Kondoh discloses a uniform taper angle (Prince, Figure 4) and (Kondoh, Figure 3). With respect to claims 21, 25, 30 glass fibers are inherent. With respect to claim 22, based on the assumption from above, JOLT in January discloses an optical assembly comprising: an illumination fiber (figures 9 and 1), a first taper fiber section (figures 9 and 2) and a collection fiber (figures 9 and 4). With respect to claim 24, the collection fiber section comprising: a second tapered fiber section (figures 9 and 3) and the light output end has a smaller diameter than the light input end.

The applicant responds as follows:

With respect to claims 1-4, the applicant has amended claim 1 above to further include that a ferrule encases the tapered fiber section and the light output end is either integrally formed with a lens surface or has a lens surface added thereto. Support for this amendment is found in the applicant's specification, page 17, lines 6-20. None of the cited references teach or suggest the inclusion of a protective ferrule that encases the tapered section. Therefore, claims 1-4, as now amended, are not anticipated by the cited references.

With respect to claims 5-7, the applicant has amended claim 5 above to further include a ferrule that is large enough to encase the tapered fiber section and a lens surface that is optically coupled with the output end of the tapered fiber section. Support for this amendment is found in the applicant's specification, page 17, lines 6-20. None of the cited references teach or suggest the inclusion of a protective ferrule that encases the tapered section. Therefore, claims 5-7, as now amended, are not anticipated by the cited references.

With respect to claims 13-14, the applicant has amended claim 5 above to further include a ferrule that is large enough to encase the tapered fiber section and a lens surface that is optically coupled with the output end of the tapered fiber section. Support for this amendment is found in the applicant's specification, page 17, lines 6-20. None of the cited references teach or suggest the inclusion of a protective ferrule that encases the tapered section. Therefore, claims 13-14, as now amended, are not anticipated by the cited references.

With respect to claim 18, the applicant has amended claim 5 above to further include a ferrule that is large enough to encase the tapered fiber section and a lens surface that is optically coupled with the output end of the tapered fiber section. Support for this amendment is found in the applicant's

specification, page 17, lines 6-20. None of the cited references teach or suggest the inclusion of a protective ferrule that encases the tapered section. Therefore, claim 18, as now amended, is not anticipated by the cited references.

With respect to claim 21, the applicant has amended claim 5 above to further include a ferrule that is large enough to encase the tapered fiber section and a lens surface that is optically coupled with the output end of the tapered fiber section. Support for this amendment is found in the applicant's specification, page 17, lines 6-20. None of the cited references teach or suggest the inclusion of a protective ferrule that encases the tapered section. Therefore, claim 21, as now amended, is not anticipated by the cited references.

With respect to claim 22, the applicant has amended claim 22 above to further specify that the light input end of said collection fiber section is optically coupled to the light output end of the tapered fiber by a reflective or scattering surface. Support for this amendment is found in the applicant's specification, page 11, lines 10-18 for example. None of the cited references teach or suggest coupling the output end of an illumination fiber section (with taper) to the input section of a collection fiber section via a reflective or scattering surface. At most they teach direct transmission or coupling via a transmissive element (not a reflective element). Therefore, claim 22, as now amended, is not anticipated by the cited references.

With respect to claims 24-25, the applicant has amended claim 22 above to further specify that the light input end of said collection fiber section is optically coupled to the light output end of the tapered fiber by a reflective or scattering surface. Support for this amendment is found in the applicant's specification, page 11, lines 10-18 for example. None of the cited references teach or suggest coupling the output end of an illumination fiber section (with taper) to the input section of a collection fiber section via a reflective or scattering surface. At most they teach direct transmission or coupling via a transmissive element (not a reflective element). Therefore, claims 24-25, as now amended, are not anticipated by the cited references.

With respect to claim 30, the applicant has amended claim 22 above to further specify that the light input end of said collection fiber section is optically coupled to the light output end of the tapered fiber by a reflective or scattering surface. Support for this amendment is found in the applicant's specification, page 11, lines 10-18 for example. None of the cited references teach or suggest coupling the output end of an illumination fiber section (with taper) to the input section of a collection fiber section via a reflective or scattering surface. At most they teach direct transmission or coupling via a transmissive element (not a reflective element). Therefore, claim 30, as now amended, is not anticipated by the cited references.

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The applicant has amended claims 1, 5, and 22 above to include additional elements not taught or suggested by the cited references. Thus, claims 1-7, 13-14, 18, 21-22, 24-25, and 30 are not anticipated by the cited references. Therefore, the applicant respectfully requests that the examiner withdraw the instant rejection.

The examiner rejected claims 1-7 as being anticipated by Nightingale (5,852,692). The examiner contends that Nightingale discloses a second fiber (in the abstract) that has a tapered fiber section (in Figure 7) comprising a light input end of a first diameter (in Figures 7 and 29) and having a light output end of a second diameter (in Figures 7 and 28) grater than said first diameter. The taper section has a generally conical shape.

The applicant has amended claims 1 and 5 above to include that a ferrule encases the tapered fiber section and the light output end is either integrally formed with a lens surface or has a lens surface added thereto and to include a ferrule that is large enough to encase the tapered fiber section and a lens surface that is optically coupled with the output end of the tapered fiber section, respectively. Support for this amendment is found in the applicant's specification, page 17, lines 6-20. Nightingale does not teach or suggest the inclusion of a protective ferrule that encases the tapered section. Therefore, claims 1-7, as now amended, are not anticipated by the cited references. Moreover, independent claims 1 and 5 require that the light output end of the tapered section be larger than the light input end. Nightingale teaches, in column 4, lines 15-26, that "[e]ach transport fiber has a tapered section so that [the] output end has a smaller diameter than [the] input end." This specifically teaches away from the applicant's requirement that the diameter of the output end of the tapered section be larger than the diameter of the input end of the tapered section.

For these reasons, the applicant contends that Nightingale does not anticipate claims 1-7 and respectfully requests that the examiner withdraw the instant rejection.

Claim Rejections - 35 U.S.C. § 103

The examiner has rejected claims 8-12, 15-17, 19-20, 23, 26-29, and 31-34 as being unpatentable over JOLT in January or Nightingale (5,852,692). With respect to claims 8-9, 15, 19, 23, 29, and 32-34, the examiner contends that Nightingale or JOLT disclose the claimed invention except for not clearly disclosing the type of connection as claimed. The examiner contends that it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the prior art system with different types of connections, since the connection type is not the scope of the invention so the modification would involve only routine skill in the art.

With respect to claims 10 and 16, the glass fibers would have been obvious.

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With respect to claim 11, JOLT or Nightingale disclose the claimed invention except for the claimed ratio (:1). The examiner contends that it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the input and output diameters with a different ratio, since it has been held that where the general conditions of a claim are disclosed in a prior art, discovering the optimum or workable ranges involves only routine skill in the art.

With respect to claims 12 and 20, JOLT discloses the claimed invention except for a collimating lens on the output end of the taper section. JOLT discloses the lens on the input end (in figure 4). The examiner contends that it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the position of the lens to make the system output more accurate.

With respect to claim 17, the taper fiber section has a generally conical shape.

With respect to claims 26-27, and 31, JOLT in January discloses the claimed invention except for the plurality of identical collection fiber sections. The examiner contends that it wold have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system in JOLT with a plurality of collection fibers, since it has been held that mere duplication of the essential working parts of a device involves only routine skill in the art.

With respect to claim 28, figure 9 in JOLT discloses the output of the first tapered fiber (in figures 9 and 2) and the input end (figures 9 and 3) of the collection fiber are coupled to one another.

The applicant responds as follows:

With respect to claims 8-12, the applicant has amended claim 5 above to further include a ferrule that is large enough to encase the tapered fiber section and a lens surface that is optically coupled with the output end of the tapered fiber section. Support for this amendment is found in the applicant's specification, page 17, lines 6-20. Neither Nightingale nor JOLT teach or suggest the inclusion of a protective ferrule that encases the tapered section. Therefore, claims 8-12, as now amended, are not unpatentable over JOLT or Nightingale.

With respect to claims 15-17, the applicant has amended claim 5 above to further include a ferrule that is large enough to encase the tapered fiber section and a lens surface that is optically coupled with the output end of the tapered fiber section. Support for this amendment is found in the applicant's specification, page 17, lines 6-20. Neither Nightingale nor JOLT teach or suggest the inclusion of a protective ferrule that encases the tapered section. Therefore, claims 15-17, as now amended, are not unpatentable over JOLT or Nightingale.

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With respect to claims 19-20, the applicant has amended claim 5 above to further include a ferrule that is large enough to encase the tapered fiber section and a lens surface that is optically coupled with the output end of the tapered fiber section. Support for this amendment is found in the applicant's specification, page 17, lines 6-20. Neither Nightingale nor JOLT teach or suggest the inclusion of a protective ferrule that encases the tapered section. Therefore, claims 19-20, as now amended, are not unpatentable over JOLT or Nightingale.

With respect to claim 23, the applicant has amended claim 22 above to further specify that the light input end of said collection fiber section is optically coupled to the light output end of the tapered fiber by a reflective or scattering surface. Support for this amendment is found in the applicant's specification, page 11, lines 10-18 for example. Neither Nightingale nor JOLT teach or suggest coupling the output end of an illumination fiber section (with taper) to the input section of a collection fiber section via a reflective or scattering surface. At most they teach direct transmission or coupling via a transmissive element (not a reflective element). Therefore, claim 23, as now amended, is not unpatentable over JOLT or Nightingale.

With respect to claim 26-29, the applicant has amended claim 22 above to further specify that the light input end of said collection fiber section is optically coupled to the light output end of the tapered fiber by a reflective or scattering surface. Support for this amendment is found in the applicant's specification, page 11, lines 10-18 for example. Neither Nightingale nor JOLT teach or suggest coupling the output end of an illumination fiber section (with taper) to the input section of a collection fiber section via a reflective or scattering surface. At most they teach direct transmission or coupling via a transmissive element (not a reflective element). Therefore, claims 26-29, as now amended, are not unpatentable over JOLT or Nightingale.

With respect to claims 31-34, the applicant has amended claim 22 above to further specify that the light input end of said collection fiber section is optically coupled to the light output end of the tapered fiber by a reflective or scattering surface. Support for this amendment is found in the applicant's specification, page 11, lines 10-18 for example. Neither Nightingale nor JOLT teach or suggest coupling the output end of an illumination fiber section (with taper) to the input section of a collection fiber section via a reflective or scattering surface. At most they teach direct transmission or coupling via a transmissive element (not a reflective element). Therefore, claims 31-34, as now amended, are not unpatentable over JOLT or Nightingale.

Therefore, the applicant respectfully requests that the examiner withdraw the instant rejection.

Conclusion

The applicant has fully responded to the issues raised by the examiner. The applicant has amended claims 1, 5, and 22, above, to patentably distinguish them from the cited references. Therefore, the applicant respectfully requests that the examiner withdraw all rejections and allow the claims to pass to issuance.

Respectfully submitted,

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